INDEX TO ILLUSTRATIONS

American Astronomical Society, Members and visitors at the Ann Arbor Meeting of the, September 2 to 5, 1919, Plate XLIII (with key) ..... Op. 559
Association of variable star observers, Photograph taken at seventh annual meeting, Plate III ..... Op. 68
Apparent paths of the planets among the stars in 1918 ..... 42, 43
Astronomical triangle, The 239
Baillaud, M. Benjamin, Plate XLVIII ..... Op. 607
Barnard, E. E., Photographs of the region of the new variable with very long period, Plate XXVI ..... Op. 374
Beta *Capricorni*, The occultation of, November 27, 1919, as visible in the United States, *William F. Rigge* 577
Borrelly's short period comet of 1903, photographed
July 22, Plate XXXI ..... Op. 439
July 24, Plate XXXII ..... Op. 439
Calendar, An ancient 594
Cluster M 11, Photograph of the, with the 40-inch telescope of the Yerkes Observatory, Plates XXXV and XXXVI ..... Op. 485
Comet and the earth, Plan of the orbits of Halley's 283
b 1919 (Brorsen-Metcalf) Photographs of, *D. W. Morehouse* 627
(Metcalf), Diagram of the orbit of 545
Borrelly's short-period, Photographed at Yerkes Observatory,
Plate XXXI ..... Op. 439
Plate XXXII ..... Op. 439
c 1919 (Metcalf-Borrelly) Diagram of orbit of 547
Faye's telescopic, photographed at Yerkes Observatory, November 10, 1910, Plate XXXI ..... Op. 439
Halley's June 6, 1910, Photographed at Yerkes, Honolulu, Beirut-Syria, Plate XXIX ..... Op. 438
Spectrum of the head of, May 5, 1910, Plate XXXII ..... Op. 439
Morehouse's, Three views of, Plate XXX ..... Op. 438
of 1901, May 11, photographed by E. E. Barnard in Sumatra, Plate XXVIII ..... Op. 437
1910 I, photographed at Yerkes Observatory, January 24 and February 3, Plate XXXIV ..... Op. 441
Constellation Charts 48, 113, 184, 250, 314, 392, 464, 532, 613, 678
Cross-staff, Aluminum head of 270
Using the 270
Delegates to the International Astronomical Union on board the Aquitania ... 603
on station platform at Ostend 605
Detroit Observatory staff, Present and former members of the, at the Ann Arbor meeting, Plate LI ..... Op. 666
Douglass, A. E., Drawings of Mars, Plate VII ..... Op. 73

Eclipse of May 28-29, 1919, Total..... 39
November 22, 1919, Annular..... 40
the moon, November 7, 1919, Partial..... 463
sun, Annular, November 22, 1919, Appearance of..... 461
Maps of...459, 460, 462
Ellison, W. F. A., Drawing of Mars, Plate VIII.....Op. 76
Encke's comet, A study of the cycles of, (diagrams).....223, 225, 226, 229, 235
Equatorial, An amateur's 288
U. S. Naval Observatory 26-inch, Eye-end of, Plate XXII...Op. 281
New dome of, Plate XX..Op. 279
mounting of, Plate XXI, Op. 289
Original mounting of, Plate XIX .....Op. 278
Eratosthenes, Drawings of the lunar crater, *William H. Pickering*,
Plate XLIV .....Op. 578
Plate XLV .....Op. 579
Photographs of the lunar crater, Plate XLVI.....Op. 582
Plate XLVII .....Op. 583
Faye's telescopic comet, November 19, 1910, Plate XXXI.....Op. 439
Geology, The time relations of astronomy and..... 504
Halley's comet and the earth, Plan of the orbit of..... 283
May 20, 1910..... 286
on June 6, 1910, photographed at Yerkes, Honolulu, Beirut-Syria, Plate XXIX.....Op. 438
Spectrum of the head of, May 5, 1910, Plate XXXII.....Op. 439
Honey, Frederic R., Right ascension and declination compared with celestial longitude and latitude..... 378
International Astronomical Union, Delegates to the, on board the Aquitania.. 603
on station platform at Ostend 605
Jupiter, Apparent orbits of the satellites of..... 44
path of, among the stars in 1918..... 43
Lenses, Completed 10-inch, U. S. Naval Observatory, Plate XXIV.....Op. 354
Lick Observatory staff, Former members of the, at the Ann Arbor meeting, Plate LII .....Op. 667
Lunar Crater Eratosthenes, Drawings of the, *William H. Pickering*,
Plate XLIV .....Op. 578
Plate XLV .....Op. 579
Photographs of the, Plate XLVI.....Op. 582
Plate XLVII .....Op. 583
McEwen, H., Drawing of Mars, Plate IX.....Op. 77
Machine for grinding and polishing lenses, *George Henry Peters*, Plate XXIII.....Op. 349
Maggini, M., Drawings of Mars, Plate VIII.....Op. 76
Plate IX .....Op. 77
Mars, Apparent path of, among the stars in 1918..... 43
Drawings of, by various observers, Plates IV and V.....Op. 69
VI and VII.....Op. 73
VIII and IX.....Op. 77
Mercury and Venus, Apparent paths of, among the stars in 1918..... 42

Messier 101, in Ursa Major, The great spiral nebula, photographed at Yerkes Observatory, Plate XXXIII....Op. 440
Meteor, Height of a (diagram).... 126
Minnesota party at Fraser, Colorado, The, ready for the eclipse.... 662
Mirror and cell ready to attach to telescope, Victoria, B. C., Plate XVI..Op. 214
The 72-inch, hoisted on the silvering car, Victoria, B. C., Plate XV Op. 212
Moon, The, photographed with the 12-inch refractor of Whitin Observatory, 1918, Plate XVII....Op. 269
100-inch reflector of the Mount Wilson Observatory, Plate XLIX....Op. 635
Moon's apparent path, The, Plate XVIII....Op. 272
geocentric orbit, The.... 274
Morehouse, D. W., Photographs of Comet *b* 1919.... 627
Morehouse's Comet of 1908, Three views of, Plate XXX....Op. 438
Naval Observatory Eclipse Expedition, Baker, Oregon, June 8, 1918, Plate II ....Op. 4
Navigation, Some extra methods in.... 382
Nebula N.G.C. 3242 in Hydra, Planetary, photographed at the Yerkes Observatory, Plate XLI....Op. 496
5457 in Ursa Major, photographed at Mt. Wilson Observatory, Plate XLII....Op. 497
The great spiral, Messier 101, in Ursa Major, Plate XXXIII....Op. 440
Neptune, Apparent path of, among the stars in 1918.... 43
orbit of the satellite of.... 45
New variable with very long period, photographs of the region of the, *E. E. Barnard*, Plate XXVI....Op. 374
Nova *Aquilae* 3, Preliminary light curve of.... 200
Sextant observations of.... 264
Spectrograms of, Plate X....Op. 168
Observatory, The Dominion Astrophysical, Victoria, B. C., Plate XII....Op. 203
Palais des Académies, Brussels.... 607
Peters, George Henry, Machine for grinding and polishing lenses, Plate XXIII ....Op. 349
Phillips, T. E. R., Drawings of Mars, Plate VI....Op. 72
Photometer, Design of a stellar, *G. A. Shook*....596, 599, 600
Photographic telescope of the U. S. Naval Observatory, Plate XXV....Op. 358
Pickering, Edward Charles, Plate XI....Op. 177
Pickering, William H., Drawings of the lunar crater Eratosthenes, Plate XLIV ....Op. 578
Plate XLV ....Op. 579
of Mars, Plate VI....Op. 72
Photographs of the lunar crater Eratsothenes, Plate XLVI ....Op. 582
Plate XLVII ....Op. 583
Planetary Nebula N.G.C. 3242 in Hydra, photographed at the Yerkes Observatory, Plate XLI....Op. 496
Planetoid capable of producing a nova, The mass of a (diagram).... 276
Precession, and the sun's motion in space.... 262

Reflector, The 72-inch with spectroscope attached, Victoria, B. C., Plate XIII ..... Op. 210
Plate XIV ..... Op. 211
Rigge, William F., The occultation of Beta *Capricorni*, 1919 November 27, as visible in the United States 577
Right ascension and declination compared with celestial longitude and latitude, *Frederic R. Honey* 378
Satellite evolution (diagram) 247
Saturn, Apparent orbits of the seven inner satellites of 44, 51
path of, among the stars in 1919 43
from a drawing by Lowell 170
Sextant, The Pulfrich 442
Shook, G. A., Design of a stellar photometer 596, 599, 600
Solar halo, May 12, 1919 (diagram) 554
Southern sky taken at Mandeville, Jamaica, Photograph of the, Plate XXVII ..... Op. 413
Spiral Nebula N.G.C. 5457 in Ursa Major, photographed at Mt. Wilson Observatory, Plate XLII ..... Op. 497
Steavenson, W. H., Drawing of Mars, Plate VIII ..... Op. 76
Sun, The, photographed with an unsilvered 10-inch speculum, *Latimer J. Wilson*, Plate XXXVII ..... Op. 489
Plate XXXVIII ..... Op. 492
Plate XXXIX ..... Op. 493
Sun's motion from solstice to solstice, (diagram) 128
Telescope, Photographic, of the U. S. Naval Observatory, Plate XXV ..... Op. 358
Thomson, H., Drawings of Mars, Plate VIII ..... Op. 76
Plate IX ..... Op. 77
Total solar eclipse, June 8, 1918, Photograph by U. S. Naval Observatory Expedition at Baker, Oregon, Plate I ..... Op. 1
of September 10, 1923, Map showing path of, in Mexico ..... Op. 133
Transit computing machine, A new 452
(diagram) 454
Triangle, The astronomical 239
Trifid Nebula in Sagittarius, The, photographed at Mt. Wilson Observatory, Plate XL ..... Op. 495
Uranus, Apparent orbits of the satellites of 45
path of, among the stars in 1919 43
Variable near X *Lacertae*, Field of new 190
star observers, Photograph at the annual meeting of the, at Harvard College Observatory, November 8, 1919, Plate LIII ..... Op. 691
V *Cygni*, Photograph of the region around the, Plate L ..... Op. 665
Venus, Apparent paths of Mercury and, among the stars in 1919 42
Wilson, Latimer J., Drawings of Mars, Plate VII ..... Op. 73
The sun, photographed with an unsilvered speculum, Plate XXXVII ..... Op. 489
Plate XXXVIII ..... Op. 492
Plate XXXIX ..... Op. 493
Yamamoto, I., Preliminary light-curve of Nova *Aquilae* No. 3 200

GENERAL INDEX

Absolute magnitude of Cepheid variables, A limiting..... 333
Absorption in the sun's spectrum from 6400 A to 9400 A, Solar and terrestrial, *W. F. Meggers*..... 35
Adolfo Stahl lectures in astronomy, The..... 265
Albrecht, Sebastian, Variations of type in the Cepheid variables *l Carinae* and *η Aquilae* as shown by the general spectrum (abstract)..... 520
Altitude in an aeroplane with a passenger, Record of..... 410
American academy of arts and sciences..... 479
association of variable star observers..... 333
Monthly report of the, 61, 120, 257, 320, 398, 470, 537, 619, 684
Astronomical Society 265
Announcement of the twenty-third meeting of the 480
Report of the twenty-second meeting of the 26
twenty-third meeting of the.. .....515, 559, 663
Antigone (129), The variability of, *Susan Raymond*..... 95
Apparent place for asteroids and comets, Reduction to..... 326
Asteroid (588) Achilles, Elements of..... 126
observation and reduction, Methods of, *George Henry Peters*..... 666
Asteroids (588) Achilles and (659) Nestor, The..... 326
Astronomers, An interesting experiment for amateur, *M. Stahl*..... 127
Group photographs of..... 631
Astronomical phenomena in 1919..... 39
Society of the Pacific..... 555
triangle, A graphical solution of the, *W. Carl Rufus*..... 238
union, Organization meeting of the American section of the proposed international, *Joel Stebbins*..... 388
The international 479
Joel Stebbins 601
Astronomy in the discovery of America, The role of, *W. Carl Rufus*..... 383
on human thought, The influence of, *Hector Macpherson*..... 17
Popular ignorance of..... 58
Aurora and sunspot, *Tom Wright*..... 551
A strange, *William H. Wagner*..... 405
of October 22, 1919, The, *Lewis J. Boss*..... 630
September 18, 1919, The, *Lewis J. Boss*..... 552
Bailey, S. I., A systematic search for novae at the Harvard Observatory (abstract) 521
Balch, Samuel W., Standard time..... 553
Ball, E. D., Computation of the height of a meteor..... 126

Barnard, E. E., A new variable star with very long period..... 374
Note on the color of Nova *Aquilae* III..... 450
On the change in the period of the variable star Bailey No. 33 in the cluster M 5 (abstract)..... 522
varnishing of astronomical negatives..... 487
(abstract) ... 524
Remeasurement of Hall's stars in the Pleiades (abstract)... 523
The gegenschein and its possible origin..... 109
Variable stars in M 11 (abstract)..... 524
the cluster, M 11 (N.G.C.6705)..... 485
Barr, John W., Does an unknown force perpetuate diurnal rotation..... 694
Bauer, L. A., Some observations of the total solar eclipse on May 29, 1919, at Cape Palmas, Liberia (abstract)..... 524
Berlingett, Alice, Mythology of the constellations (Poem)..... 268
Night (Poem) 209
To Halley's Comet (Poem)..... 338
Beta *Cygni* a triple system..... 265
Betelgeuse (α *Orionis*)..... 60
Binaries, Orbits of three spectroscopic..... 482
Binary Boss 4507, The orbit of the spectroscopic, *W. E. Harper*..... 568
ι *Delphini*, The orbit of the spectroscopic, *W. E. Harper*..... 567
stars, Orbits of spectroscopic..... 484
The 61
masses of thirty-two visual, *J. H. Pitman*..... 664
Blencoe, David A., A study of the cycles of Encke's comet..... 215
Boecklen, Carl, Leap years with fifty-three Sundays..... 419
Boss, Lewis J., The aurora of October 22, 1919..... 630
September 18, 1919..... 552
Brush, Judson W., Solar halo, May 12, 1919..... 554
Bulletin Astronomique, The.....411, 480
Bureau of longitudes, American correspondents of the..... 556
Burka, S. M., Hypersensitizing commercial panchromatic plates (abstract)... 526
Calendar and it reformation by Julius Caesar, The Roman, *Roscoe Lamont*.. 583
The reform of the..... 334
Julian, *Roscoe Lamont*..... 637
Campbell, Leon, Some recent developments in the study of SS *Cygni* (abstract) 526
Cannon, Annie J., Edward Charles Pickering..... 177
The spectra of variable stars of long period (abstract).. 527
Catalogue of the zone + 25° to + 30°..... 555
7412 stars 555
Cawthron Institute, The..... 332
Celestial objects for small telescopes, Southern *Bernard Thomas*..... 444
Changing of the date at the 180th meridian, The, *Albert S. Flint*..... 416
Charlier, C. V. L., Monistic and dualistic conceptions of the stellar universe.. 306
Chase, Gilbert P., Sunset of Venus..... 552
Class B spectra having hydrogen emission lines, Studies of, *R. H. Curtiss*... 530
Cluster M 11 (N.G.C. 6705), Variable stars in the, *E. E. Barnard*..... 485
(abstract). 524
The globular, Messier 22 (N.G.C. 6656) *Harlow Shapley* and *J. C. Duncan*..... 100

Color index of planets, *Edward S. King*..... 570
of a star, A new method of determining the, *Edward S. King*..... 30
Comet *a* 1918 (Reid), Elements of..... 196
d 1918 (Schorr) Elements and ephemeris of..... 123
New elements of..... 629
a 1919 (Kopff's) 545
Ephemeris of 549
New elements of..... 693
b 1919 (Brorsen-Metcalf)..... 545
Elements of 627
Ephemeris of.....549, 628, 693
New elements of..... 628
Observations of 546
Photographs of 627
Borrelly's 1905 II by M. G. Fayet, Ephemeris of..... 196
c 1919 (Metcalf).....546, 693
Elements of 548
Ephemeris of 548
Observations of 547
d 1919 (Finlay-Sasaki), Elements, ephemeris and observations..... 692
e 1919 (1911 VII) (Schaumasse)..... 691
Elements and ephemeris..... 550
De Vico's 1846 IV, Search ephemeris for..... 550
Encke's at aphelion, *F. E. Seagrave*..... 125
Finlay's periodic 549
Giacobini's 1900 III, Search ephemeris for, *F. E. Seagrave*..... 628
Halley's 1910, *Maxwell Hall*..... 281
Ephemeris of 548
(Schorr) New 56
Wolf's 56
Periodic 197
1786 II, Definitive orbit of..... 123
Comets, A year of, *Maynard Shipley*..... 437
rediscovered, Two periodic..... 691
The periodic 698
Complaint from the southern hemisphere, A..... 411
Comstock, George C., Atmospheric refraction near the horizon (abstract).... 529
Cordeiro, F. J. B., Motion of a particle about a circular disc..... 646
Some extra methods in navigation..... 380
The Pulfrich sextant..... 441
Corona at the eclipse of June 8, 1918, Spectra of the solar, *J. A. Parkhurst*.. 38
Coronal structure, Evidences of change in, during the eclipse of June 8, 1918, *John A. Miller*..... 663
Coronium in natural gas..... 631
Counterglow, The gegenschein or, *E. E. Barnard*..... 289
Cudworth, Warren H., Edward Charles Pickering (Poem)..... 407
Curtiss, R. H., Studies of class B spectra having hydrogen emission lines (abstract) 530
Date at the 180th meridian, The changing of the, *Albert S. Flint*..... 416
Dawson, Bernhard H., The brightness of the moon at various phases..... 327

De Lury, Ralph E., Apparent relation between Chinese earthquakes and California tree growths 0-1680 A. D. (abstract) 560
Fluctuations in the moon's longitude in relation to meteorological variations (abstract) 559
Levels of the great lakes in relation to numbers of sunspots (abstract) 561
Simultaneous spectroscopic observations of the rate of rotation in north and south solar hemispheres (abstract) 563
Destruction of human life, Respecting a possible, *Charles Nevers Holmes*.... 447
Diameters of the heavenly bodies, A method of determining the..... 333
Dicyanin, Application of, to photography of stellar spectra..... 131
Distances of six planetary nebulae, The..... 410
the stars, The, *S. C. Hunter*..... 198
Diurnal rotation, Does an unknown force perpetuate, *John W. Barr*..... 694
Divine infinitude, In presence of, *Charles Nevers Holmes*..... 101
Double star, New..... 633
stars, Σ 208 and Σ 1834, The..... 199
on photographs, Measures of, *Charles P. Olivier*..... 664
Douglass, A. E., The periodograph and its application to variable star periods and other problems (abstract)..... 563
Draper Catalogue, The Henry..... 557
Dugan, R. S., On the eclipsing variables RT *Persei* and U *Cephei* (abstract) 531
Duncan, J. C., The globular cluster Messier 22 (N.G.C. 6656) (abstract).... 100
moon's orbit as an elementary exercise..... 269
Earthquakes and California tree growths, Apparent relation between Chinese, *Ralph E. DeLury*..... 560
Eaton, Howard O., Monthly report of the American Association of variable star observers 684
Eclipse expedition, June 8, 1918, The Naval Observatory, *John C. Hammond* 1
of June 8, 1918, as observed in Omaha, The solar, *William F. Rigge*.. 96
Photometric results at the, *Jakob Kunz* and *Joel Stebbins* 31
The total, *John A. Miller*..... 36
May 28-29, Solar 479, 697
September 10, 1923, The total, *Joaquin Gallo*..... 133
the moon, November 7, 1919, Partial, *William F. Rigge*..... 463
sun, May 29, 1919, The total.....267, 410
of November 22, 1919, as visible in the U. S., The annular, *William F. Rigge*.....458, 674
partial 696
on May 29, 1919, at Cape Palmas, Liberia, Some observations of the total, *L. A. Bauer*..... 524
photographs, Exhibit of..... 333
Eclipses of the same series with that of May 29, 1919, *F. E. Seagrave*..... 406
Encke's comet, A study of the cycles of, *David A. Blencoe*..... 215
Equatorial, An amateur's, *Clarence E. Woodman*..... 287
instrument of the Naval Observatory, Brief description of 26-inch, *Asaph Hall* 26, 278
Equinoctial precession and the sun's motion in space, A possible relation between, *W. E. Glanville*..... 261

Eratosthenes I, A study for the amateur, *William H. Pickering*..... 579
Eros, Ephemeris for asteroid (433) *Margaret Harwood*..... 124
of, *F. E. Seagrave*..... 125
in 1900-1901, The variability of, *Margaret Harwood*..... 28
Errata 132, 412
Ether, The luminiferous, *Frank W. Very*..... 155
Fatigue effect of selenium cells..... 556
Film sensitivity of photographic plates, Note on the, *Harlan True Stetson*... 151
Flash spectrum of June 8, 1918, The, *H. C. Wilson*.....290, 365, 421, 656
Flint, Albert S., The changing of the date at the 180th meridian..... 416
Francis, Vincent, Novae..... 7
Fundamental star positions, Announcement concerning the formation of a new catalog of, *C. D. Perrine*..... 89
Galaxies, On the existence of external..... 634
Gallo, Joaquin, The total eclipse of September 10, 1923..... 133
Gegenschein and its possible origin, The, *E. E. Barnard*..... 109
or counterglow, The, *E. E. Barnard*..... 289
Geology, The time relations of astronomy and, *William H. Pickering*... 498
Glanville, W. E., A possible relation between equinoctial precession and the sun's motion in space 261
Glass for telescopes, The early home of..... 409
Gravimeter and its applications, A differential, *Luis Rodés*..... 96
Gravity, Measurements of..... 202
Hailstorms, Fatalities during, *C. F. Talman*..... 405
Remarkable, *William H. Pickering*..... 248
Hale, George E., Preliminary results of a comparative test of the 60-inch and 100-inch telescopes of the Mount Wilson Observatory (abstract) 563
The 100-inch telescope of the Mount Wilson Observatory.. 635
Hall, Asaph, Brief description of 26-inch equatorial instrument of the Naval Observatory 278
The 26-inch equatorial instrument of the Naval Observatory (abstract) 26
series of satellite observations made with the 26-inch equatorial of the Naval Observatory (abstract)..... 26
Halley's comet 1910, *Maxwell Hall*..... 281
To, *Alice Berlingett*..... 338
Hall, Maxwell, Halley's comet 1910..... 281
Hall's stars in the Pleiades, Remeasurement of, *E. E. Barnard*..... 523
Hammond, J. C., Rates of the standard Sidereal clocks at the U. S. Naval Observatory (abstract) 566
The Naval Observatory eclipse expedition, June 8, 1918... 1
Harper, W. E., Note on the spectrum of Nova *Aquilae* No. 3 (abstract)..... 567
The orbit of the spectroscopic binary Boss 4507 (abstract).... 568
ι *Delphini* (abstract).... 567
19 *Lyncis* (abstract).... 27
orbits of the spectroscopic components of Boss 5173 (abstract) 27
spectrum and velocity of Nova *Aquilae* No. 3, The (abstract) 28

Harwood, Margaret, Ephemeris for asteroid (433) Eros..... 124
The variability of Eros in 1900-1901 (abstract)..... 28
Helium bands in the spectrum of γ *Argus,* Shifting absorption at the heads of the brighter, *C. D. Perrine*..... 665
Henroteau, F., Note on the spectroscopic binary 55 *Ursae Majoris* (abstract) 29
Highest village on the earth, The..... 409
High-level laboratories for scientific research, On the construction of, *David Todd* 152
Holmes, Charles Nevers, A planet which did not exist..... 476
Homeward bound (Poem)..... 25
In presence of divine infinitude..... 101
Respecting a possible destruction of human life..... 447
The sky-dial (Poem)..... 120
Honey, Frederic R., Right ascension and declination compared with celestial longitude and latitude..... 377
Hooker Telescope, The 100-inch of the Mount Wilson Observatory, *George E. Hale*..... 635
Howe, H. A., A desideratum in solving Kepler's problem (abstract)..... 569
How old is the world? *William Harvey McNairn*..... 79
Hoyt, Wilbur Franklin, To the spectroscope (Poem)..... 202
Hunter, S. C., The distances of the stars..... 198
"Hydrogen Envelop Star," The size of a..... 266
Hypersensitizing commercial panchromatic plates, *S. M. Burka*..... 526
Index to star catalogues, The Yale, *Margaretta Palmer*..... 37
Influence of astronomy on human thought, The, *Hector Macpherson*..... 17
International astronomical union..... 479
societies and the war..... 330
Japetus, Eclipse of Saturn's satellite..... 57
The eclipse of, in the shadows of the ball and ring system of Saturn 57
Jeans, J. H., The present position of the nebular hypothesis..... 339
Jenkins, Louise F., Resumé of sunspot observations at Mt. Holyoke College 1918 131
Jordan, Frank C., Notes on the light-curves of XX *Cygni* and U *Pegasi* (abstract) 30
Jupiter's satellites 50
Phenomena of.....49, 116, 185, 251
Karstens, H. R., A curious meteor..... 198
Kepler's problem, A desideratum in solving, *H. A. Howe*..... 569
Kiess, C. C., False spectra produced by gratings (abstract)..... 574
The red and infra-red arc spectra of eight elements (abstract). 570
King, Edward S., A new method of determining the color of a star (abstract) 30
Color index of planets (abstract)..... 570
Koep, John, Results of meteoric observations for 1916-18..... 477
Kunz, Jakob, Photometric results at the eclipse of June 8, 1918 (abstract)... 31
Lacertae, 12, *R. M. Motherwell*..... 37
Lamont, Roscoe, The Roman Calendar and its reformation by Julius Caesar 583
The reform of the Julian calendar..... 637
Lampland, C. O., Hubble's variable nebula in Monoceros N.G.C. 2261 (abstract) 31
Photographic observations of the great nebula in Orion (abstract) 571

Lampland, C. O., Some photographic results of the Lowell Observatory solar eclipse expedition (abstract) 33
Variable stars in the Lagoon (N.G.C. 6523) and Trifid (N.G.C. 6514) nebulae (abstract) 32
Latitude work, List of 3162 stars for 632
Leap years with fifty-three Sundays, *Carl Boecklen* 419
Leavitt, Henrietta S., The light-curves of eleven novae (abstract) 35
Lens, To the (Poem) 412
Levels of the great lakes in relation to numbers of sun-spots, *Ralph E. De Lury* 561
Lick Observatory eclipse expedition, The 130
Light-curves of eleven novae, The, *Henrietta S. Leavitt* 35
XX *Cygni* and U *Pegasi*, Notes on the, *Frank C. Jordan* 30
Locke, Musa F., Nova Stella, June 1918 (Poem) 86
Longitude and latitude of the U. S. Naval Observatory eclipse station at Baker, Oregon, Determination of the, *Charles Clayton Wylie* 359
Lord, H. C., Star tables good to the year 2000 for civil engineers and navigators (abstract) 572
Lowell Observatory eclipse expedition, Some spectroscopic results of the, *V. M. Slipher* 148
solar eclipse expedition, Some photographic results of the, *C. O. Lampland* and *E. C. Slipher* 33
Macpherson, Hector, The influence of astronomy on human thought 17
Magnetic polarity of sunspots, The 696
Mars in "Gulliver's Travels," Satellites of 480
Report on, No. 21, *William H. Pickering* 69, 136
Mass of a planetoid capable of producing a nova, The, *William H. Pickering* 275
Mathematical Association of America 57
McNairn, William Harvey, How old is the world? 79
Measuring machine, Inquiry in regard to 58
Meggers, W. F., False spectra produced by gratings (abstract) 574
Solar and terrestrial absorption in the sun's spectrum from 6400 A to 9400 A (abstract) 35
The red and infra-red arc spectra of eight elements (abstract) 570
Meteor, A curious, *H. R. Karstens* 198
very bright, *J. Watson Thompson* 477
Computation of the height of a, *E. D. Ball* 127
society, Notice to the American, *Charles P. Olivier* 122
Meteoric observations for 1916-18, Results of, *John Koep* 477
Meteorites and meteors, *William H. Pickering* 203
Metric system, The 482
Micrometrical observations of the sun, Direct, *E. D. Roe, Jr.* 675
Milky Way, The (Poem) 147
spectrum of the, *V. M. Slipher* 676
Miller, John A., Evidences of a change in coronal structure during the eclipse of June 8, 1918 (abstract) 663
The masses of thirty-two visual binary stars (abstract) ... 664
total eclipse of June 8, 1918 (abstract) 36
Mirror for the sun, An unsilvered, *Latimer J. Wilson* 489

Monistic and dualistic conceptions of the stellar universe, *C. V. L. Charlier*.. 306
Moon at various phases, The brightness of the, *Bernhard H. Dawson*..... 327
Moon's longitude in relation to meteorological variations, Fluctuations in the *Ralph E. De Lury*..... 559
orbit as an elementary exercise, The, *John C. Duncan*..... 269
Motherwell, R. M., 12 *Lacertae* (abstract)..... 37
Nova *Aquilae* No. 3 (abstract)..... 36
Motion of a particle about a circular disc, *F. J. B. Cordeiro*..... 646
Mythology of the constellations, *Alice Berlingett*..... 268
Naval Observatory eclipse expedition, June 8, 1918, The, *John C. Hammond* 1
Navigation, Some extra methods in, *F. J. B. Cordeiro*..... 380
Nebulae, What are the, *Russell Sullivan*..... 495
Nebula, Hubble's variable, in Monoceros, N.G.C. 2261, *C. O. Lampland*..... 31
in Orion, Photographic observations of the great, *C. O. Lampland*... 571
Nebular hypothesis, The present position of the, *J. H. Jeans*..... 339
Nebulous lines in R *Aquarii*..... 634
Night, *Alice Berlingett*..... 209
Nipher's "Gravitational" experiment and the anomalies of the moon's motion, *Frank W. Very*..... 158
Northern lights on the morning of March 28..... 330
Norton's star atlas..... 411
Nova, An interesting..... 557
Aquilae No. 3, *I. Yamamoto*..... 200
J. A. Parkhurst..... 167
Note on the color of, *E. E. Barnard*..... 450
spectrum of, *J. S. Plaskett*..... 93
W. E. Harper..... 567
Observations of 58
Position of, *R. M. Stewart*..... 152
R. M. Motherwell..... 36
Sextant observations of, *J. Ernest G. Yalden*..... 263
The early spectrum of, *C. D. Perrine*..... 92
position and proper motion of, *Robert Trumpler*.. 154
Visual estimates of the brightness of, *Joel Stebbins*... 242
stella, June 1918, *Musa F. Locke*..... 86
Novae, *Vincent Francis*..... 7
Observatories, The selection of sites for astronomical, *William H. Pickering* 413
Observatory for New Zealand, A solar..... 479
The Brussels, little injured..... 696
Occultation of Beta *Capricorni* 1919, Nov. 27, as visible in the United States, The, *William F. Rigge*..... 576
Tables for determining approximately the outline of the region of visibility of an, *Arthur Snow*..... 104
Occultations visible at Washington....52, 114, 185, 252, 315, 394, 466, 533, 614, 679
in the United States.....615, 679
O'Connor, John L., Simultaneous spectroscopic observations of the rate of rotation in north and south solar hemispheres (abstract)..... 562
Olcott, William Tyler, Monthly report of the American Association of variable star observers.....61, 120

Olivier, Charles P., Measures of double stars on photographs (abstract)..... 664
Notice to the American Meteor society..... 122
Optical glass made in America..... 331
Orientation, A correction in, *Latimer J. Wilson*..... 698
Orion Nebula, Spectra of the..... 557
Palmer, Margaretta, The Yale index to star catalogues (abstract)..... 37
Parallax of Nova *Persei*..... 409
the Orion nebula..... 331
William H. Pickering..... 407
Parallaxes of two stars in Pisces..... 633
Parkhurst, J. A., An intensely red variable star..... 655
Nova *Aquilae* No. 3..... 167
Spectra of the solar corona at the eclipse of June 8, 1918 (abstract)..... 38
Suspected variable star in the trapezium of the Orion nebula 578
Periodograph and its application to variable star periods and other problems, The, *A. E. Douglass*..... 563
Perrine, C. D., Announcement concerning the formation of a new catalog of fundamental star positions (abstract)..... 89
Changes in the spectra of some early-type stars showing hydrogen emission (abstract)..... 90
Shifting absorption at the heads of the brighter helium bands in the spectrum of γ *Argus* (abstract)..... 665
The early spectrum of Nova *Aquilae* No. 3, (abstract)..... 92
Peters, George Henry, Methods of asteroid observation and reduction (abstract)..... 666
The photographic telescope of the U. S. Naval Observatory..... 349
Pettit, Edison, Studies in prominence characteristics (abstract)..... 669
The great eruptive prominences of May 29 and July 15, 1919 (abstract)..... 667
Pettit, Hanah Steele, The proper motions and parallaxes of 359 stars in the cluster *h Persei* (abstract)..... 671
Phillips, Edward C., A new transit reduction computing machine..... 451
On a mechanical method of reducing transit observations (abstract)..... 92
Photometer, Design of a stellar, *G. A. Shook*..... 595
Photo-electric photometry, Progress in, *Joel Stebbins*..... 677
Pickering, David B., Edward Charles Pickering..... 257
Pickering, Edward C., The relation of proper motions to spectra (abstract).. 95
Pickering, Edward Charles, *Annie J. Cannon*..... 177
David B. Pickering..... 257
Warren H. Cudworth..... 407
Pickering, William H., A suggestion as to satellite evolution..... 246
Eratosthenes I, a study for the amateur..... 579
Meteorites and meteors..... 203
Parallax of the Orion nebula..... 407
Remarkable hail-storms..... 248
Report on Mars, No. 21.....69, 136
The mass of a planetoid capable of producing a nova 275

Pickering, William H., The selection of sites for astronomical observatories 413
time relations of astronomy and geology..... 498
Pitman, J. H., The masses of thirty-two visual binary stars (abstract)..... 664
Planet Notes.....47, 113, 183, 250, 314, 392, 464, 532, 613, 679
which did not exist, A, *Charles Nevers Holmes*..... 476
Planetoid capable of producing a nova, The mass of a, *William H. Pickering* 275
Plaskett, J. S., Notes on the spectrum of Nova *Aquilae* (abstract)..... 93
Report on progress of work with the 72-inch telescope (abstract) 674
The 72-inch reflecting telescope of the Dominion Astrophysical Observatory, Victoria, B. C..... 210
(abstract) 94
The spectroscopic orbits and dimensions of the eclipsing variables U *Ophiuchi*, RS *Vulpeculae*, and TW *Draconis* (abstract) 672
Prizes of the Paris Academy of Sciences..... 57
Probable error of radial velocities determined with the one prism spectrograph, The, *R. K. Young*..... 158
Prominence characteristics, Studies in, *Edison Pettit*..... 669
Prominences of May 29 and July 15, 1919, The great eruptive, *Edison Pettit* 667
Proper motion, variable, of R *Lyrae*..... 555
Proper motions and parallaxes of 359 stars in the cluster *h Persei*, The, *Hannah Steele Pettit*..... 671
to spectra, The relation of, *Edward C. Pickering*..... 95
Radio time signals..... 331
Raymond, Susan, The variability of Antigone (129) (abstract)..... 95
Red and infra-red arc spectra of eight elements, The, *C. C. Kiess* and *W. F. Meggers*..... 570
Refraction near the horizon, Atmospheric, *George C. Comstock*.....529
Refractor, The focal length of the 36-inch..... 265
Relativity discussion, The bearing of the hypothesis of a gravitational limit on the current, *Frank W. Very*..... 156
Report of the committee on stellar parallaxes for the year ending June 30, 1918 164
the advisability of substituting the civil day beginning at midnight for the astronomical day beginning at noon..... 162
variable stars 160
on Mars, No. 21, *William H. Pickering*.....69, 136
Rhorer, S. Lynn, Solar Halos..... 406
Rigge, William F., Partial eclipse of the moon 1919, November 7..... 463
The annular eclipse of the sun of 1919, November 22, as visible in the U. S.....458, 674
occultation of Beta *Capricorni* 1919, November 27, as visible in the United States..... 576
solar eclipse of June 8, 1918, as observed in Omaha (abstract) 96
Right ascension and declination compared with celestial longitude and latitude, *Frederic R. Honey*..... 377
ascensions, Preliminary notes on an annual term in the, *Meade L. Zimmer* 159

Rodés, Luis, A differential gravimeter and its applications (abstract)..... 96
Roe, E. D., Jr., Direct micrometrical observations of the sun (abstract)..... 675
Rotation in north and south solar hemispheres, Simultaneous spectroscopic observations of the rate of, *Ralph E. DeLury*..... 562
Rufus, W. Carl, A graphical solution of the astronomical triangle..... 238
The role of astronomy in the discovery of America..... 383
Russell, Henry Norris, Orbit of *σ Ursae Majoris,* 21306 (abstract)..... 97
Sanford, R. F., Spectrum of Bailey's variable star No. 95 in the globular cluster M 3 (abstract)..... 99
The orbit of the spectroscopic binary star *p Velorum* (abstract)..... 99
Satellite evolution, A suggestion as to, *William H. Pickering*..... 246
observations made with the 26-inch equatorial of the Naval Observatory, *Asaph Hall*..... 26
Saturn, The wonder of the worlds, *John H. Thayer*..... 169
Saturn's satellites.....51, 115, 185, 252, 316
Saving daylight in Georgia..... 551
Seagrave, F. E., Eclipses of the same series with that of May 29, 1919..... 406
Encke's comet at aphelion..... 125
Ephemeris of Eros..... 125
Search ephemeris for Giacobini's comet 1900 III..... 628
Venus 406
Search for novae at the Harvard Observatory, A systematic, *S. I. Bailey*..... 521
Sextant readings, Corrections to, determined with a meridian circle, *Elliot Smith*..... 87
The Pulfrich, *F. J. B. Cordeiro*..... 441
Shapley, Harlow, The globular cluster Messier 22 (N.G.C. 6656) (abstract) 100
Shipley, Maynard, A year of comets..... 437
Shook, G. A., Design of a stellar photometer..... 595
Sidereal clocks at the U. S. Naval Observatory, Rates of the standard, *J. C. Hammond* and *C. B. Watts*..... 566
solar clock, A combination..... 332
Sigma *Ursae Majoris,* 21306, Orbit of, *Henry Norris Russell*..... 97
Sites for astronomical observations, The selection of, *William H. Pickering* 413
Sky dial, The, *Charles Nevers Holmes*..... 120
Slipher, E. C., Some photographic results of the Lowell Observatory eclipse expedition (abstract) 33
Slipher, V. M., Some spectroscopic results of the Lowell Observatory eclipse expedition (abstract) 148
The spectra of two variable nebulae: A new type of nebular spectrum (abstract) 149
of the Milky Way (abstract..... 676
Smith, Elliott, All-American time (abstract)..... 676
Corrections to sextant readings determined with a meridian circle 87
Smithsonian Chilean Expedition, The..... 266
Snow, Arthur, Tables for determining approximately the outline of the region of visibility of an occultation..... 104
Occultations visible in the United States.....615, 679
Solar halo, May 12, 1919,*Judson W. Brush*..... 554
halos observed at Tee Harbor, Alaska..... 480

Solar halos, *S. Lynn Rhorer* 406
motion, The 59
rotation, Notes on, *Charles E. St. John* and *Louise W. Ware* 98
Solution of the astronomical triangle, A graphical, *W. Carl Rufus* 238
Southern celestial objects for small telescopes, *Bernard Thomas* 444
Spectra of some early-type stars, showing hydrogen emission, Changes in the, *C. D. Perrine* 90
two variable nebulae, The: A new type of nebular spectrum, *V. M. Slipher* 149
variable stars of long period, The, *Annie J. Cannon* 527
produced by gratings, False, *W. F. Meggers, C. C. Kiess* and *F. M. Walters, Jr.* 574
The relation of proper motions to, *Edward C. Pickering* 95
Spectroscope, To the, *Wilbur Franklin Hoyt* 202
Spectroscopic binaries, Twelve new 59
binary 19 Lyncis, The orbit of the, *W. E. Harper* 27
55 *Ursae Majoris*, Note on the, *F. Henroteau* 29
star *p Velorum*, The orbit of the, *R. F. Sanford* 99
components of Boss 5173, The orbits of the, *W. E. Harper* 27
orbits and dimensions of the eclipsing variables U *Ophiuchi*, RS *Vulpeculae*, and TW *Draconis*, The, *J. S. Plaskett* 672
Spectrum and velocity of Nova *Aquilae* No. 3, The, *W. E. Harper* 28
of Bailey's variable star No. 95 in the globular cluster M 3, *R. F. Sanford* 99
June 8, 1918, The flash, *H. C. Wilson* 290, 365, 421
SS *Cygni*, Some recent developments in the study of, *Leon Campbell* 527
Stahl, M., An interesting experiment for amateur astronomers 127
Standards of magnitude for the astrographic catalogue 557
Standard time, *Samuel W. Balch* 553
Star, A new 695
in Sagitta 633
tables good to the year 2000 for civil engineers and navigators, *H. C. Lord* 572
Stars whose spectra are composite 266
Stebbins, Joel, Organization meeting of the American section of the proposed international astronomical union 388
Photometric results at the eclipse of June 8, 1918 (abstract) .. 31
Progress in photo-electric photometry (abstract) 677
The international astronomical union 601
Visual estimates of the brightness of Nova *Aquilae* No. 3 242
Stellar parallaxes 132
substance, The wasting of, *Frank W. Very* 157
universe, Monistic and dualistic conceptions of the, *C. V. L. Charlier* 306
Stetson, Harlan True, Note on the uniformity of film sensitivity of photographic plates (abstract) 151
War time instruction at the Harvard astronomical laboratory (abstract) 150
Stewart, R. M., Position of Nova *Aquilae* No. 3 (abstract) 152
St. John, Charles E., Notes on solar rotation (abstract) 98
Sullivan, Russell, What are the nebulae? 495

Sunspot apparition, Length of a 632
observations, Resumé of, at Mt. Holyoke College, 1918, *Louise F. Jenkins* 131
Talman, C. F., Fatalities during hailstorms 405
Telegrams, Harvard College Observatory, Astronomical 631
Telescope of the Dominion Astrophysical Observatory, The 72-inch reflecting, *J. S. Plaskett* 210
U. S. Naval Observatory, The photographic, *George Henry Peters* 349
Report on progress of work with the 72-inch, *J. S. Plaskett* 674
The 72-inch reflecting, *J. S. Plaskett* 94
Temperature at center of sun 555
measurements in deep wells 558
Test of the 60-inch and 100-inch telescopes of the Mount Wilson Observatory, Preliminary results of a comparative, *George E. Hale* 563
Thayer, John H., Saturn, The wonder of the worlds 169
Thomas, Bernard, Southern celestial objects for small telescopes 444
Thompson, J. Watson, A very bright meteor 477
Time, All-American, *Elliott Smith* 676
from the U. S. Naval Observatory signals, Accurate, *Charles Clayton Wylie* 490
relations of astronomy and geology, The, *William H. Pickering* 498
Todd, David, On the construction of high-level laboratories for scientific research (abstract) 152
Tokyo Observatory, Visit to, *M. Yamasaki* 629
Transit observations, On a mechanical method of reducing, *Edward C. Phillips* 92
reduction computing machine, A new, *Edward C. Phillips* 451
Trümpler, Robert, The position and proper motion of Nova *Aquilae* No. 3 (abstract) 154
Tycho Brahe's observation books 556
Ultra-violet radiation, A new source of 556
Variables RT *Persei* and U *Cephei*, On the eclipsing, *R. S. Dugan* 531
Variable in Libra, New 533
Variable star, An intensely red, *J. A. Parkhurst* 655
Bailey No. 33 in the cluster M 5, On the change in the period of the, *E. E. Barnard* 522
in M 11 524
the trapezium of the Orion nebula, Suspected, *J. A. Parkhurst* 578
New 190
observations 62, 121, 192, 258, 321, 399, 471, 538, 620
observers, Monthly report of the American Association of *Howard O. Eaton* 684
Ida E. Woods 191, 257, 320, 398, 470, 537, 619
William Tyler Olcott 61, 120
UV *Persei* 684
U *Cygni* 684
ω Arietis 680
with very long period, A new, *E. E. Barnard* 374

Variable stars in the cluster M 11 (N.G.C. 6705) *E. E. Barnard*..... 485
Lagoon (N.G.C. 6523) and Trifid (N.G.C. 6514) nebulae, *C. O. Lampland*..... 32
Maxima of, of short period.....52, 119, 189, 253, 319, 394, 466, 536, 618, 683
Minima of, of short period.....54, 117, 187, 255, 317, 396, 468, 534, 616, 681
Ten new 632
Variations of type in the Cepheid variables *l* Carinae and η Aquilae as shown by the general spectrum, *Sebastian Albrecht*..... 520
Varnishing of astronomical negatives, On the, *E. E. Barnard*.....487, 524
Venus, *Frank E. Seagrave*..... 406
Sunset of, *Gilbert P. Chase*..... 552
Very, Frank W., Galatic and atomic vortices (abstract)..... 158
On Nipher's "Gravitational" experiment and the anomalies of the moon's motion (abstract)..... 158
The luminiferous ether—its relation to the electron and to a universal atmosphere (abstract)..... 156
wasting of stellar substance (abstract)..... 157
What is the bearing of the hypothesis of a gravitational limit on the current relativity discussion (abstract)..... 156
Vortices, Galactic and atomic, *Frank W. Very*..... 158
Wagner, William H., A strange aurora..... 405
Walters, F. M., Jr., False spectra produced by gratings (abstract)..... 574
Ware, Louise W., Notes on solar rotation (abstract)..... 98
War time instruction at the Harvard astronomical laboratory, *Harlan True Stetson*..... 150
Watts, C. B., Rates of the standard sidereal clocks at the U. S. Naval Observatory (abstract) 566
Wave-length of the chief aurora line..... 558
Wave-lengths in the spectra of Krypton and Xenon..... 696
Wilson, H. C., The flash spectrum of June 8, 1918.....290, 365, 421, 656
Wilson, Latimer J., A correction in Orientation..... 698
An unsilvered mirror for the sun..... 489
Wireless signals during a solar eclipse..... 555
Woodman, Clarence E., An amateur's equatorial..... 287
Woods, Ida E., Monthly report of the American Association of variable star observers.....191, 257, 320, 398, 470, 537, 619
World, How old is the, *William Harvey McNairn*..... 79
Wright, Tom, Aurora and sunspot..... 551
Wylie, Charles Clayton, Accurate time from the U. S. Naval Observatory signals 490
Determination of the longitude and latitude of the U. S. Naval Observatory eclipse station at Baker, Oregon 359
Yalden, J. Ernest G., Sextant observations of Nova *Aquilae* No. 3..... 265
Yamamato, I., Nova *Aquilae* No. 3..... 200
Yamasaki, M., Visit to Tokyo Observatory..... 629
Yerkes Observatory, 1918 at..... 130

Young, R. K., The probable error of radial velocities determined with the one prism spectograph of the Dominion Astrophysical Observatory (abstract) 158
Zeta, *Ursae Majoris,* Period and elements of the orbit of..... 632
Zimmer, Meade L., Preliminary note on an annual term in the right ascensions (abstract) 159